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Modular transportable processing plant and mineral process evaluation unit

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<p>(54) Title: MODULAR TRANSPORTABLE PROCESSING PLANT AND MINERAL PROCESS EVALUATION UNIT</p> <p>(57) Abstract</p> <p>A modular and transportable processing plant for recovery of metal values, comprising a crushing stage which comprises a primary dry crushing stage (13), a screening stage (15) included after the primary crushing stage (13) to separate oversize for return to the primary crushing stage (13), and a secondary wet crushing stage (25); a post-crushing stage which comprises a classification stage (29) to separate fines from non-fines, and a ball mill (37) to grind the non-fines, the ground non-fines being recycled to said classification stage (29); a dewatering and/or thickening stage (31) to extract water from the fines to produce a concentrated slurry, a leaching circuit (43) incorporating agitation with oxygen, to form a cyanide metal complex, an adsorption circuit (49) to adsorb the cyanide metal complex on activated carbon; and a continuous elution stage (51) to recover metal values therefrom for subsequent recovery of metal therefrom.</p>			

TITLE

Modular Transportable Processing Plant and Mineral Process Evaluation Unit

FIELD OF THE INVENTION

The present invention relates to a processing plant for recovery of metal values using inter-alia carbon loading of cyanide-metal complexes. In particular, the invention relates to such a process plant that is readily transportable. Depending upon the metal value being recovered from the ore, the concentration and recovery stage will be varied.

BACKGROUND ART

There exist marginal mineral deposits which are potential short term mines, which are usually not mined due to the high initial set-up cost rendering mining not economically viable. These leases are usually small deposits, but can include deposits whose mineralogy results in high refining costs.

It is an object of this invention to provide a processing plant which can be put to use on small deposits, and can also be used for pilot testing and evaluation of ore deposits.

Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

DISCLOSURE OF THE INVENTION

In the following description, the elements of the processing plant are in sequential order corresponding to the main flow of ore therethrough.

In accordance with the invention there is provided a modular and transportable processing plant for processing metalliferous ore to recover of metal values therefrom, said processing plant being capable of processing said ore at a continuous rate of up to between 20 and 30 tonnes per hour, said processing plant comprising:

a crushing stage which comprises a primary dry crushing stage and optionally a secondary crushing stage, with a first screening stage included after said primary crushing stage to separate oversize for return to the primary crushing stage;

a post-crushing stage for receiving undersize from said second screening stage, said post-crushing stage comprising a classification stage to separate fines from non-fines, and a ball mill to grind said non-fines, the ground said non-fines being recycled to said classification stage;

said ball mill being characterised by having an in-line drive from its power plant and being driven through a gearbox, the ball mill, gearbox, and power plant being assembled on a chassis for transport as a unit by road;

a dewatering and/or thickening stage to extract water from said fines to produce a concentrated slurry;

and an extraction and recovery stage to extract and recover said metal values from said concentrated slurry.

Preferably said gearbox is a planetary gearbox.

Preferably said processing plant is adapted for recovery of metal values by loading of cyanide-metal complexes onto activated carbon, and said extraction and recovery stage comprises:



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at least one leach stage incorporating agitation with oxygen, to form a cyanide metal complex;

at least one adsorption stage to adsorb cyanide metal complex on activated carbon; and

a continuous elution stage to recover metal values therefrom for subsequent recovery of metal therefrom.

In the case of processing gold bearing ore, the metal may most preferably be electro-won from said metal values.

Alternatively said extraction and recovery stage may be a flotation module, for recovering nickel, copper, or other metal values, or any other suitable processing stage.

Preferably said primary dry crushing stage comprises a jaw crusher.

Preferably said jaw crusher is has a crushed ore nominal maximum output size of between 50 mm and 70 mm. Preferably the nominal maximum output size of the crushed ore is 60 mm. It will be understood that up to 10 % of the crushed ore may exceed the nominal maximum output size, as is typical with crushers of all types. Any ore exceeding the nominal maximum output size is considered to be oversize, and is separated by the screening stage for return to the primary dry crushing stage. In this regard the primary dry crushing stage is defined as operating in closed circuit configuration.

Preferably the undersize from said primary crusher is arranged to discharge to a reversible conveyor, the reversible conveyor being arranged to discharge to said plant when operated in a forward direction, and being arranged to discharge to a stockpile or alternative or additional processing when operated in a reverse direction. Since the primary crusher can produce well in excess of the required plant capacity, the use of a reversible conveyor in the manner described provides a simple way of diverting excess ore from the primary crusher. This diverted ore



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from the primary crusher can be sent for additional or alternative processing. Additional processing could include duplicated downstream processing of the ore from the primary crusher, while alternative processing for gold bearing ore could include subjecting the gold ore to a heap leach.

Preferably said secondary crushing stage is a secondary wet crushing stage.

Preferably said secondary wet crushing stage includes a cone crusher which has water added to the feed along with crushed ore from said first crushing stage. A "Waterflush" TM cone crusher is suitable for this purpose, and most preferred. The purpose of using water in the crushing stage is to prevent choking of the cone crusher.

It will be understood that where the ore is sufficiently friable, the secondary crushing stage may be omitted entirely, or the secondary crusher may be run dry (without water).

Preferably a screening stage is included after said secondary wet crushing stage to screen out all oversize for return to said secondary crushing stage.

Preferably the dimension for oversize from said secondary crushing stage is greater than between 3.5 and 10 mm. The most preferred dimension for oversize from said wet second crushing stage is greater than 6 mm.

Preferably said primary dry crushing stage is capable of receiving and crushing ore having a maximum dimension of up to 1000mm.

Preferably said post-crushing stage includes means to remove coarse metal from said non-fines, before said non-fines enter said ball mill. In such an arrangement, preferably said coarse metal is subsequently further purified. The further purification may take the form of treating said coarse metal to form cyano-metal complex and electro-winning metal therefrom. This is particularly appropriate where the processing plant is used for recovery of noble metals.



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Preferably said at least one leach stage includes at least two leach tanks, with at least one of said leach tanks including a closed circuit high agitation reactor and associated oxygen injection, to allow rapid leaching of the precious metals and thereby minimise the residence time of the concentrated slurry in the leach stage.

Preferably each said leach tank includes a draft tube and agitator to circulate the concentrated slurry undergoing leaching.

Preferably the adsorption stage includes a plurality of tanks arranged to operate in carousel mode, to allow feed to be diverted to any tank, whereby any tank may be selectively drained for subsequent processing of its contents and/or for maintenance of the tank and its screen which separates ore slurry containing cyanide metal complex from the activated carbon. In such an arrangement, the tanks are interconnected by piping having valves, so that the first and last tanks in the sequence can be selected, or more preferably the entire order of tanks in the sequence can be selected.

Preferably said continuous elution stage comprises an acid wash and hot water stripping.

In accordance with a second aspect of the invention there is provided a method of processing metalliferous ore for recovery of metal values, said method comprising processing said ore in a modular and transportable processing plant as hereinbefore described.

The method is most preferably utilised for the processing of ore for recovering metal values by loading of cyanide-metal complexes onto activated carbon, wherein said extraction and recovery step comprises adding cyanide to said concentrated slurry and subjecting it to at least one leach step incorporating agitation with oxygen, to form a cyanide metal complex; adsorbing said cyanide metal complex onto activated carbon; eluting said activated carbon containing adsorbed cyanide metal complex in a continuous elution stage to recover metal values therefrom for subsequent recovery of metal therefrom.



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In the case of processing gold bearing ore, the metal may most preferably be electro-won from said metal values.

Preferably said post-crushing step includes a step where coarse metal is removed from said non-fines, before said non-fines enter said ball mill. In such a method, preferably said coarse metal is subsequently subjected to further purification. The further purification may take the form of treating said coarse metal to form cyano-metal complex and electro-winning metal therefrom. This is particularly appropriate where the processing plant is used for recovery of noble metals, such as gold.

Preferably the adsorption step is conducted in a plurality of tanks arranged to operate in carousel mode, to allow feed to be diverted to any tank, whereby any tank may be selectively drained for subsequent processing of its contents.

Preferably said continuous elution step incorporates a continuous acid wash and hot water wash of said activated carbon.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in the following description of one specific embodiment thereof being a modular and transportable processing plant for recovery of gold from ore containing the same, made with reference to the drawings in which:

Figure 1 is a flow diagram showing the crushing stage of the plant and method thereof;

Figure 2 is a flow diagram showing the post-crushing stage, de-watering/thickening stage and leach stages, of the plant and method



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thereof;

Figure 3 is a flow diagram showing the carbon adsorption stage and elution stage, and an optional coarse metals purification stage of the plant and method thereof;

Figure 4 is a side elevation of a ball mill utilised in the plant;

Figure 5 is a diagram showing a continuous acid wash stage utilised ahead of the elution stage in the plant;

Figure 6 is a diagram showing the elution stage of the plant; and

Figure 7 is a site plan showing a typical overall plant setup.

BEST MODE(S) FOR CARRYING OUT THE INVENTION

The processing plant has been designed as a relocatable modular plant for on site treatment of gold bearing and other metalliferous ores, at a continuous rate of between 20 and 30 tonnes per hour, nominally 25 tonnes per hour. All sections of the plant are designed in a modular format to allow the components to be easily assembled on a site and subsequently disassembled for relocation to another site on completion of an assignment.

Referring to Figure 1, run of mine ore is loaded into a hopper 11 before being sent to a primary crushing stage in the form of a jaw crusher 13, via a vibratory feeder (not shown). The jaw crusher 13 is a compact unit with an opening size of 750 mm by 1000 mm, and is sized to ensure that the normally expected size lumps can be accepted from the run of mine material. The jaw crusher 13 can handle up to 150 tph with a closed side setting of 60 mm, which gives a nominal maximum output size of the crushed ore of 60 mm.

Crushed ore leaves the jaw crusher 13 and enters a reversible conveyor 14, at a position away from either end thereof. The reversible conveyor 14 is operated in a forward direction and discharges crushed ore to a scalping screen 15. The scalping screen 15 separates the crusher product into three streams, oversize which is greater than 60 mm, which is conveyed to a stockpile 17 for recirculation through the jaw crusher 13. Crushed ore which lies between 6 mm and 60 mm is

conveyed from the scalping screen 15 to a plant feed bin 19, with excess over demand being diverted by a splitter box 20 to a plant feed stockpile 21. Crushed ore which is less than 6 mm is conveyed from the scalping screen 15 to a fines stockpile 23.

The jaw crusher 13 and scalping screen 15 are only required to operate on a day shift basis. Feed to the remainder of the plant during night shift operations is provided from the plant feed stockpile 21. However, it will be understood that some sites or operations may lend themselves to full utilisation of the primary crushing stage by crushing for a heap leach or other operations when not required for the plant of the embodiment. To provide feed for a heap leach process, the reversible conveyor 14 can be operated in a reverse direction and the discharge 24 can be directed to heap leaching. It will be understood that the presence of oversize does not greatly affect a heap leach process.

In the assembled module, the hopper 11 is accessible by a front end loader which delivers run of mine ore. The assembled module comprising the hopper 11 and jaw crusher 13 has a bin located below and beside the hopper 11. Aggregate is packed around the void and body to build a ramp extending over the void to the hopper 11. The weight of aggregate around the body provides the assembled module with stability, and reduces the size of concrete slab required, on which such crushing stages are typically built. Alternatively, the bin could be filled with aggregate to provide additional stability if desired.

The hopper 11 and jaw crusher 13 comprise one module when assembled, but are transported as separate pieces. A first piece comprises a base having a body at one end containing the bin, a flight of access stairs at the other end, and an area in the centre where the reversible conveyor 14 is fitted for receiving discharge from the jaw crusher 13. The reversible conveyor discharges over either side of the base, and is removed for transport in order to reduce the width of the module for ease of transportation. The second piece sits on top of the first piece and contains the remainder of the body continuing the void at one end, a

further flight of stairs at the other end to continue the stairs of the first piece, and the jaw crusher 13 in the centre. The third piece contains the hopper 11 at one end located above the void, with the vibratory feeder leading to the feed opening of the jaw crusher 13, and with a landing from the access stairs at the other end.

When it is desired to move the assembled module, the ramp is removed, before the assembled module is broken up into its three pieces.

Crushed ore from the plant feed bin has lime added for pH adjustment, before being conveyed to the secondary crushing stage.

The secondary crushing stage includes a Waterflush crusher 25 which is a 980 mm cone crusher, and crushes the ore to 6 mm or less. The Waterflush crusher 25 has been selected for its ability to crush from 60 mm feed to 6 mm product, thereby eliminating the need for tertiary crushing or SAG milling ahead of the ball mill. A high recirculating load for plus 6 mm size ore is designed into the screening and conveying circuit to allow for treatment of hard ores.

Any fines (6 mm or less) in the fines stockpile are conveyed via the plant feed bin 19, after the plant feed bin 19 is emptied of 60 mm to 6 mm product which it normally carries. These fines are diverted via the screen feeder 27 in order to bypass the Waterflush crusher 25.

Referring to Figure 2, the post-crushing stage comprises an initial classification stage 29 where particles fine enough to allow liberation of the gold in the leaching process (fines) are diverted as overflow to a thickener stage 31. Underflow (non-fines) which requires further grinding is sent via a sieve bend 32 with a 2 mm aperture size. Undersize from the sieve bend 32 proceeds to a splitter box 33 where high specific gravity material is separated. This high specific gravity material will comprise coarse gold in a gold mining operation. A gravity concentrator 35 (a high 'g' force Falcon concentrator) separates coarse gold from fines entrained in solution. The coarse gold is sent for further processing. It will be understood that where the ore is of such a type that coarse

gold (native gold) is not present, the splitter box 33 and gravity concentrator 35 may be omitted.

The remaining non-fines are ground in a ball mill 37, along with oversize from the sieve bend 32, and after grinding the ground product is returned to the classification stage 29. As non-fines are ground sufficiently to fines, they are diverted as overflow to the thickener stage 31 in the classification stage 29.

The ball mill 37 is shown in greater detail in Figure 4, and has a 520 kW power plant 39 for drive, with power being transferred through a planetary-type transmission. The assembly of the ball mill 37, the power plant 39 and the transmission is mounted on a chassis 41, to allow transport thereof as a unit direct to any mine site. This obviates set-up and alignment routines that would be required if the assembly required dismantling and assembling between use at different sites.

The overflow fines which are nominally 80% minus 75 microns, after thickening in the thickener 31 are fed to the leach stage. The thickener 31 is a "Wren Technologies" unit which has no moving parts and can be transported as one unit, on its side. The thickener has a maximum diameter of 3.4 metres, and a height of 9 metres.

Referring to Figure 3, the leach stage includes two identical leach tanks 43a and 43b from which thickened ore slurry and cyanide is pumped by pumps 45a and 45b through high agitation reactors 47a and 47b, which include oxygen injection into the slurry to allow rapid leaching of the precious metals from the fine ore. The injection of oxygen into the slurry and a high recirculating load in this process, enables the residence time required for leaching to be minimised. The output of reactors 47a and 47b is recirculated to the leach tanks 43a and 43b respectively.

Output from the leach tank 43a is fed to pump 45b, and output from the leach tank 43b is fed to a third leach tank 43c. The three leach tanks 43a, 43b, and

43c are included with draft tubes and agitators, and are able to be transported as complete tanks. The leach tanks 43 each have a volume of 40 cubic metres, and a diameter of 2.9 metres. The reactors 47a and 47b are in line 'Filblast' units, although other similar high agitation and oxygen injection technology could be employed. Gold cyanide complex from the third leach tank 43c is fed to the adsorption stage.

The adsorption stage 48 includes Anglo American 'pump cells' in six tanks 49 of equal volume, which operate in a carousel mode. All gold bearing carbon is eluted and re-activated prior to contact with the gold bearing slurry, promoting fast loading and high loading rates of the gold onto the activated carbon. By the term "carousel mode", the tanks are arranged so that any tank may be selectively drained for subsequent processing of its contents and/or for maintenance of the tank and its screen which separates ore slurry containing cyanide metal complex from the activated carbon. In this embodiment, the tanks are interconnected by piping having valves, so that the first and last tanks in the sequence can be selected, and in addition the entire order of tanks in the sequence can be selected. The six tanks 49 are arranged on two side by side chassis as two rows of three tanks, which may be divided for transport as two units. The total volume of the six tanks 49 is 75 cubic metres.

The elution stage 51 for removing the gold from the carbon has been designed as a continuous operation, based on the AARL system, to handle nominally 1 tonne of carbon a day, thus minimising equipment sizes and heat load requirements. The elution system and electrowinning cell are incorporated into one module which can be transported in one load. Referring now to Figure 5 the loaded carbon undergoes a continuous acid wash in a column 55. The loaded carbon is fed into the top of the column 55 and falls under the influence of gravity. Hot water is fed into the base of the column and flows upward past the carbon. At a position near the top third of the column, hydrochloric acid is introduced and flows up the column with the hot water. Aqueous acid solution over-flows the top of the column. Recovered treated carbon is then subjected to elution in the

elution column 57, shown in detail in Figure 6. The loaded carbon is stripped of gold (or other metal). In the case of gold stripping, the loaded carbon is stripped using hot water, and is removed via a 500um mesh wire screen filter 59, where the gold is then electro-won using a standard electrowinning technique.

The use of a continuous acid wash in the manner described herein has a number of advantages over other known techniques. The use of a column and injection of the acid into hot water flowing up the column obviates the need to use a heat exchanger for the acid. Heat exchangers for heating acid are expensive, in view of the material from which they must be constructed, given the corrosive nature of hydrochloric acid. In addition, less potable quality rinse water is required than other known processes require for pre-elution washing of loaded carbon. Finally, the temperature parameters for the acid wash and elution steps in the process may be altered depending upon the metal being recovered.

Referring to Figure 3, coarse gold from the gravity concentrator 35 is fed to a gold purification stage which comprises a jig table 53.

Ancillary equipment such as the trash screen, the tailings screen, the reactivation module 61 for reactivating carbon, the chemical mixing module 63, water tanks, lime silo 65, and motor/electrical control rooms 67 are all of modular design and generally each able to be transported as one assembled component. All of the equipment breaks down into transportable modules (some of which have been described here in detail) that do not exceed 4.25 metres in width and 4.25 metres in height, with a maximum length of 13.5 metres.

The main commercial applications of the modular and transportable plant are in marginal mineral deposits where short term operation of hitherto known and used plant is not economically viable. The modular and transportable plant allows utilisation as a relocatable production plant on small deposits that would otherwise not warrant the development of a full scale permanent production facility. The modular and transportable plant allows pilot testing and evaluation of ore deposits to be readily undertaken, particularly on those deposits having

complex metallurgy which requires investigation of process options. Evaluation of operating cost of gold recovery in economically marginal deposits can readily be undertaken at minimal expense. In addition, the modular and transportable plant allows for establishment of process steps and operating costs as a prelude to final plant design and or as part of a detailed feasibility study on a major ore body. The modular and transportable plant can also be utilised in existing mine sites where processing difficulties are being encountered, so that process modifications may be tested, without disrupting the day to day operations of the mine and its existing plant.

It should be appreciated that the scope of the invention is not limited to the scope of the particular embodiment described herein, which is given by way of example only. It will be understood that depending upon the metal value being recovered from the ore, the concentration and recovery stage will be varied. For example, while the embodiment utilises carbon loading and elution to extract, concentrate, and recover gold from the concentrated slurry, this is simply because this technique is most suitable for recovering gold values from ore.

The form that the "downstream" processing takes after crushing and grinding will depend on the nature of the ore. For ores other than gold ores or other metals amenable to extraction by carbon loading and elution, different downstream processing of the concentrated slurry will be required. For example, an alternative embodiment may be utilised for extraction of metal values from sulphide ores. Typically, sulphide ores of nickel and base metals (including copper, lead and zinc) are concentrated by flotation. Flotation is the process by which a frothing agent is added to the ground slurry and air is passed through the mixture. The desired sulphide mineral is separated from the mixture by preferential attachment to the froth bubbles, which are collected from the top of the flotation cell. The waste material, which does not float, is separated from the bottom of the cell. Smelting, chemical or biological leaching, solvent extraction, electrowinning, etc can further process the concentrate. However, this further processing is commonly not conducted at the mine site, with the concentrate

being transported to a central production facility for this purpose. Accordingly, in such an alternative embodiment, the carbon adsorption stage, continuous elution stage and the electrowinning stage will be replaced by a flotation module.

As an alternative processing option, biological leaching may be used on refractory gold or other metal sulphide ores, either in conjunction with flotation or as an alternative processing option. Acid leaching, atmospheric or pressure leach, and ammoniacal leaching are other methods of treating metalliferous ore slurries, particularly for nickel and copper oxidised ores, which are believed to be readily catered for if required, by making appropriate changes to the plant of the invention.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS

1. A modular and transportable processing plant for processing metalliferous ore to recover metal values therefrom, said processing plant being capable of processing said ore at a continuous rate of up to between 20 and 30 tonnes per hour, said processing plant comprising:
 - a crushing stage which comprises a primary dry crushing stage and optionally a secondary crushing stage, with a first screening stage included after said primary crushing stage to separate oversize for return to the primary crushing stage;
 - a post-crushing stage for receiving undersize from said second screening stage, said post crushing stage comprising a classification stage to separate fines from non-fines, and a ball mill to grind said non-fines; the ground said non-fines being recycled to said classification stage;
 - said ball mill being characterised by having an in-line drive from its power plant and being driven through a gearbox, the ball mill, gearbox, and power plant being assembled on a chassis for transport as a unit by road;
 - a dewatering and/or thickening stage to extract water from said fines to produce a concentrated slurry;
 - and an extraction and recovery stage to extract and recover said metal values from said concentrated slurry.
2. A processing plant as claimed in claim 1 wherein said gearbox is a planetary gearbox.
3. A processing plant as claimed in claim 1 or 2, adapted for recovery of metal values by loading of cyanide-metal complexes onto activated carbon, wherein said extraction and recovery stage comprises:
 - at least one leach stage incorporating agitation with oxygen, to form a cyanide metal complex;
 - at least one adsorption stage to adsorb cyanide metal complex on activated carbon; and



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a continuous elution stage to recover metal values therefrom for subsequent recovery of metal therefrom.

4. A plant as claimed in any one of the preceding claims wherein an electrowinning stage is utilised after said continuation elution stage, to electro-win metal from said metal values.
5. A processing plant as claimed in claim 1 or 2, adapted for recovery of metal values as sulphides, wherein said extraction and recovery stage comprises a flotation module
6. A plant as claimed in any one of the preceding claims wherein said primary dry crushing stage comprises a jaw crusher.
7. A plant as claimed in claim 6 wherein said jaw crusher has a crushed ore nominal maximum output size of between 50 mm and 70 mm.
8. A plant as claimed in claim 7 wherein the nominal maximum output size of the crushed ore is 60 mm, and the primary crushing circuit is configured to operate in closed circuit configuration.
9. A plant as claimed in any one of the preceding claims wherein the undersize from said primary crusher is arranged to discharge to a reversible conveyor, the reversible conveyor being arranged to discharge to said plant when operated in a forward direction, and being arranged to discharge to a stockpile or alternative or additional processing when operated in a reverse direction.
10. A plant as claimed in any one of the preceding claims wherein said secondary crushing stage is a cone crusher which has water added to the feed along with crushed ore from said first crushing stage.



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11. A plant as claimed in any one of the preceding claims wherein a screening stage is included after said secondary crushing stage to screen out all oversize for return to said secondary wet crushing stage.
12. A plant as claimed in any one of the preceding claims wherein the dimension for oversize from said secondary crushing stage is greater than between 3.5 and 10 mm.
13. A plant as claimed in claim 12 wherein the dimension for oversize from said secondary crushing stage is greater than 6 mm.
14. A plant as claimed in any one of the preceding claims wherein said primary dry crushing stage being capable of receiving and crushing ore having a maximum dimension of up to 1000mm.
15. A plant as claimed in any one of the preceding claims wherein said post-crushing stage includes means to remove coarse metal from said non-fines, before said non-fines enter said ball mill.
16. A plant as claimed in any one of the preceding claims wherein said at least one leach stage includes at least two leach tanks, with at least one of said leach tanks including a closed circuit high agitation reactor and associated oxygen injection, to allow rapid leaching of the precious metals and thereby minimise the residence time of the concentrated slurry in the leach stage.
17. A plant as claimed in claim 16 wherein each said leach tank includes a draft tube and agitator to circulate the concentrated slurry undergoing leaching.
18. A plant as claimed in any one of the preceding claims wherein the adsorption stage includes a plurality of tanks arranged to operate in carousel mode, to allow feed to be diverted to any tank, whereby any tank may be selectively drained for subsequent processing of its contents or for maintenance, and wherein the tanks are interconnected by piping having valves, so that the first



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and last tanks in the sequence can be selected, and optionally the entire order of tanks in the sequence can be selected.

19. A plant as claimed in any one of the preceding claims wherein said continuous elution stage is configured for acid washing and hot water stripping.
20. A method of processing metalliferous ore for recovery of metal values, using a plant as claimed in any one of the preceding claims.
21. A modular and transportable processing plant for recovery of metal values by loading of cyanide-metal complexes onto activated carbon, substantially as herein described with reference to the drawings.



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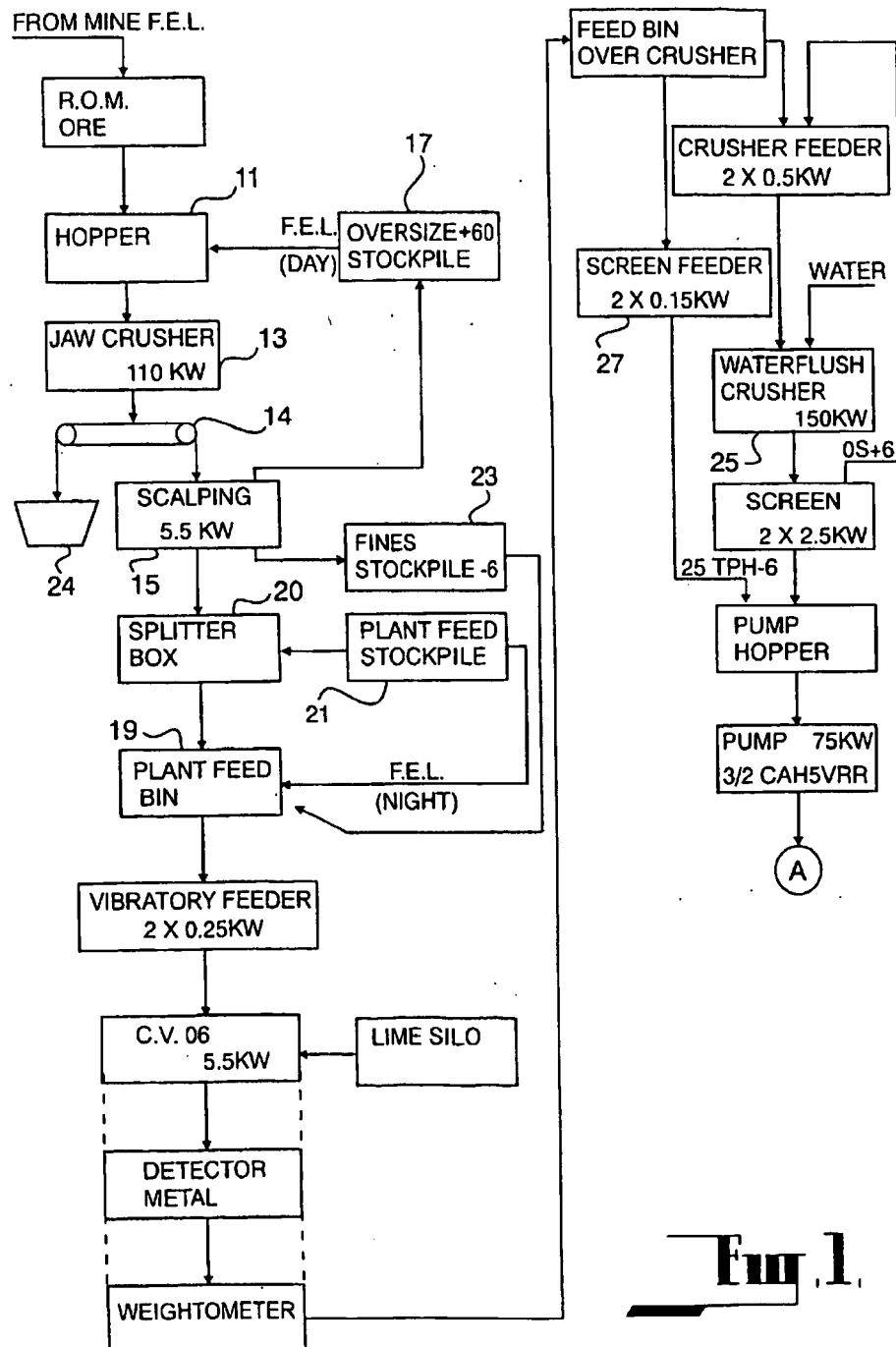


Fig. 1.

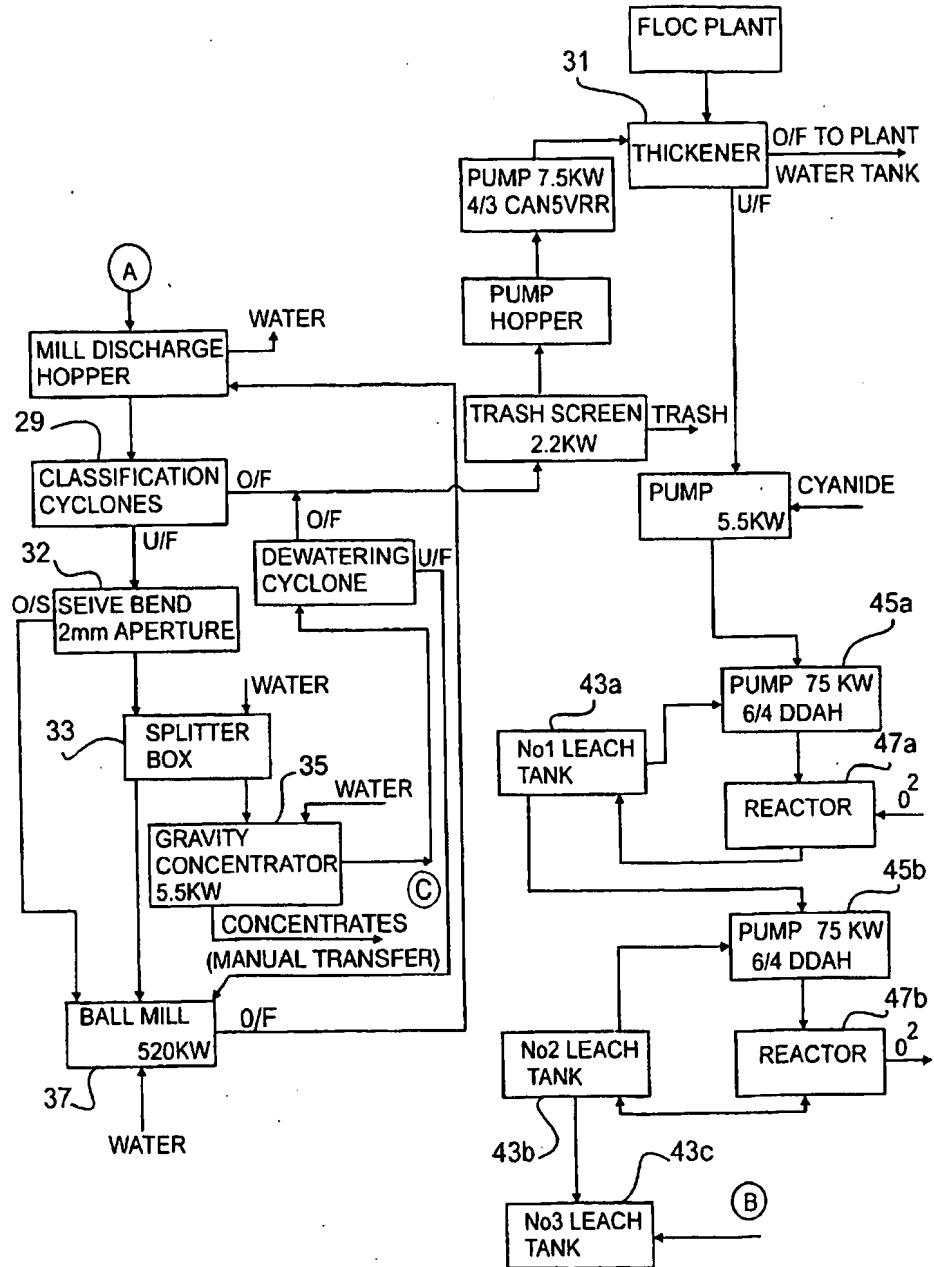


Fig. 2

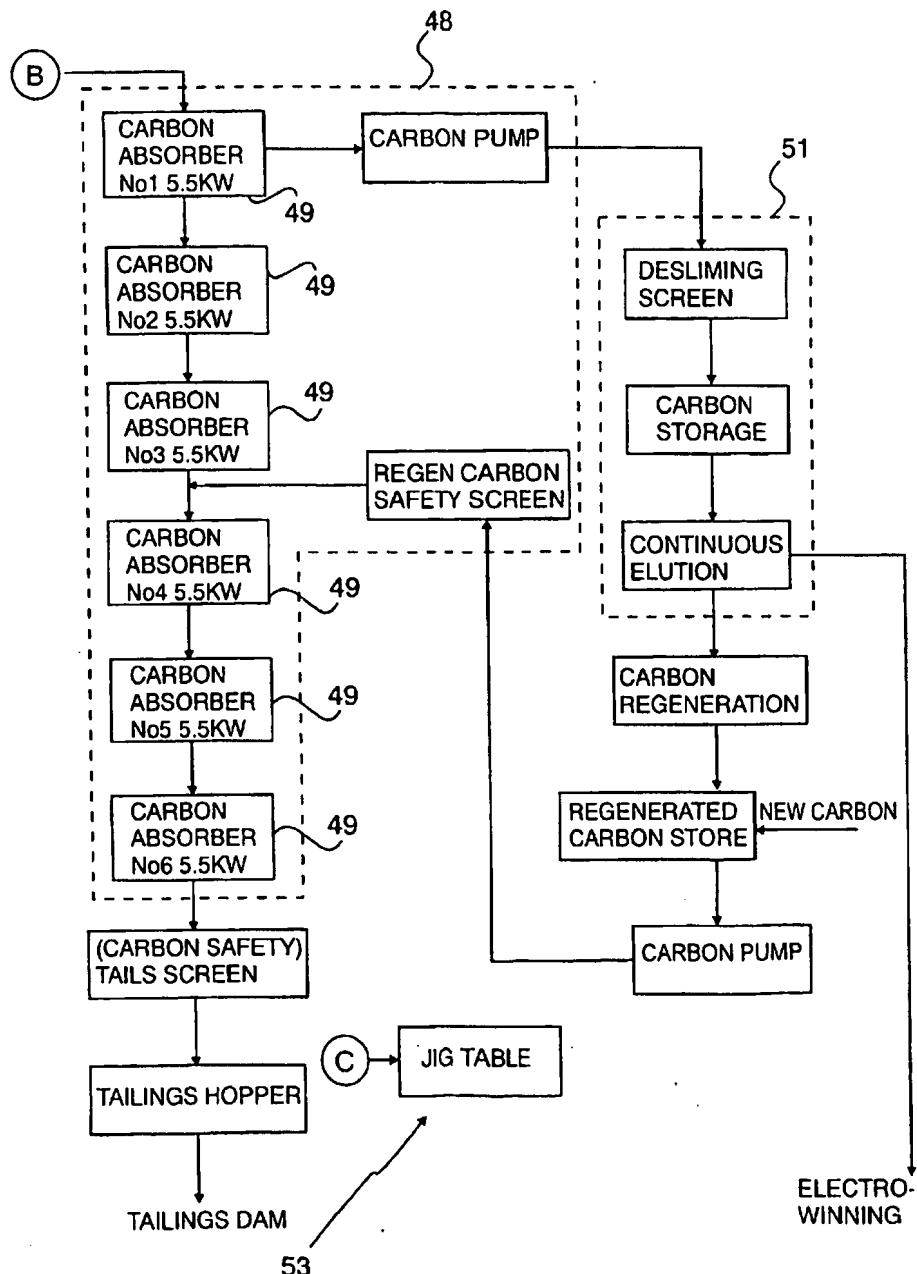
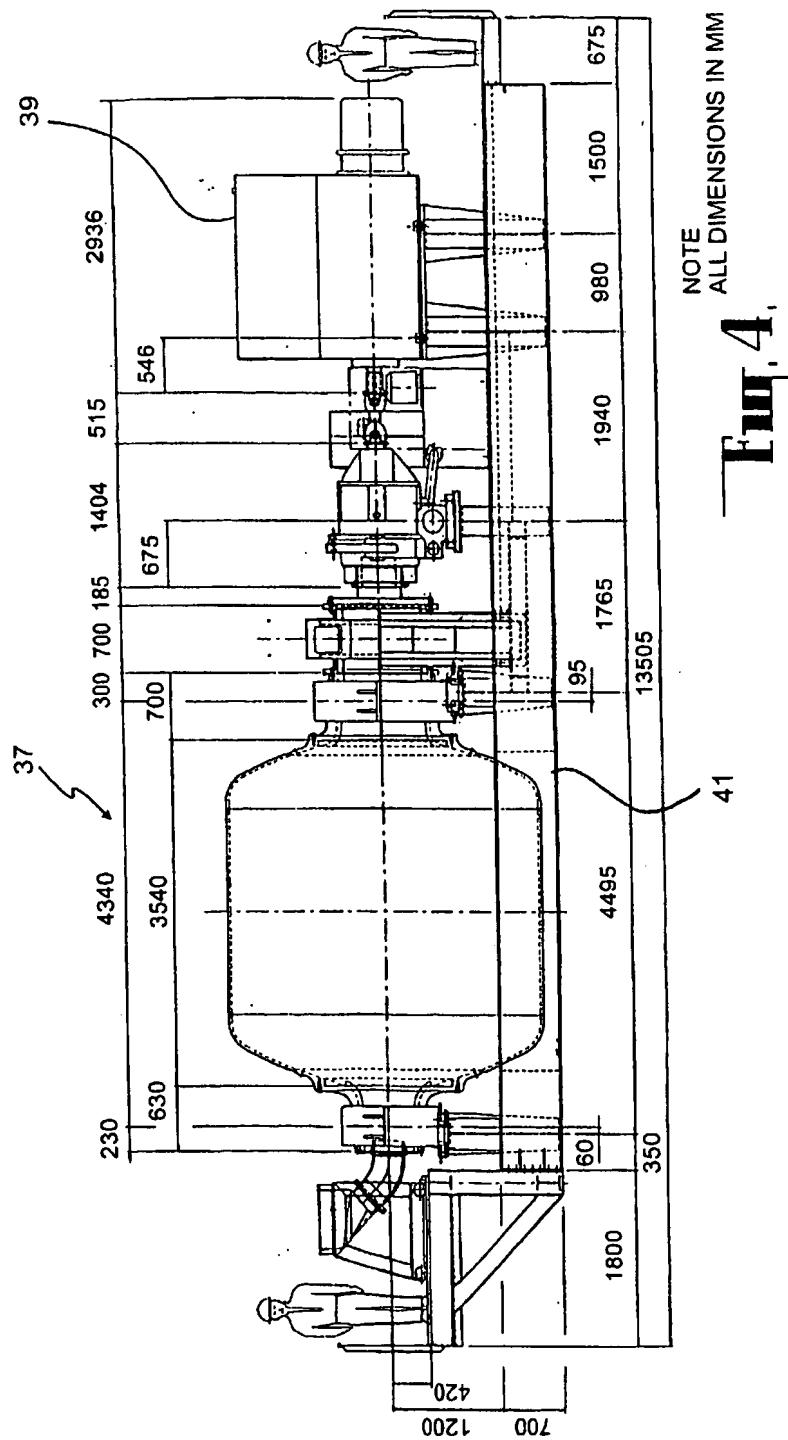


Fig. 3.



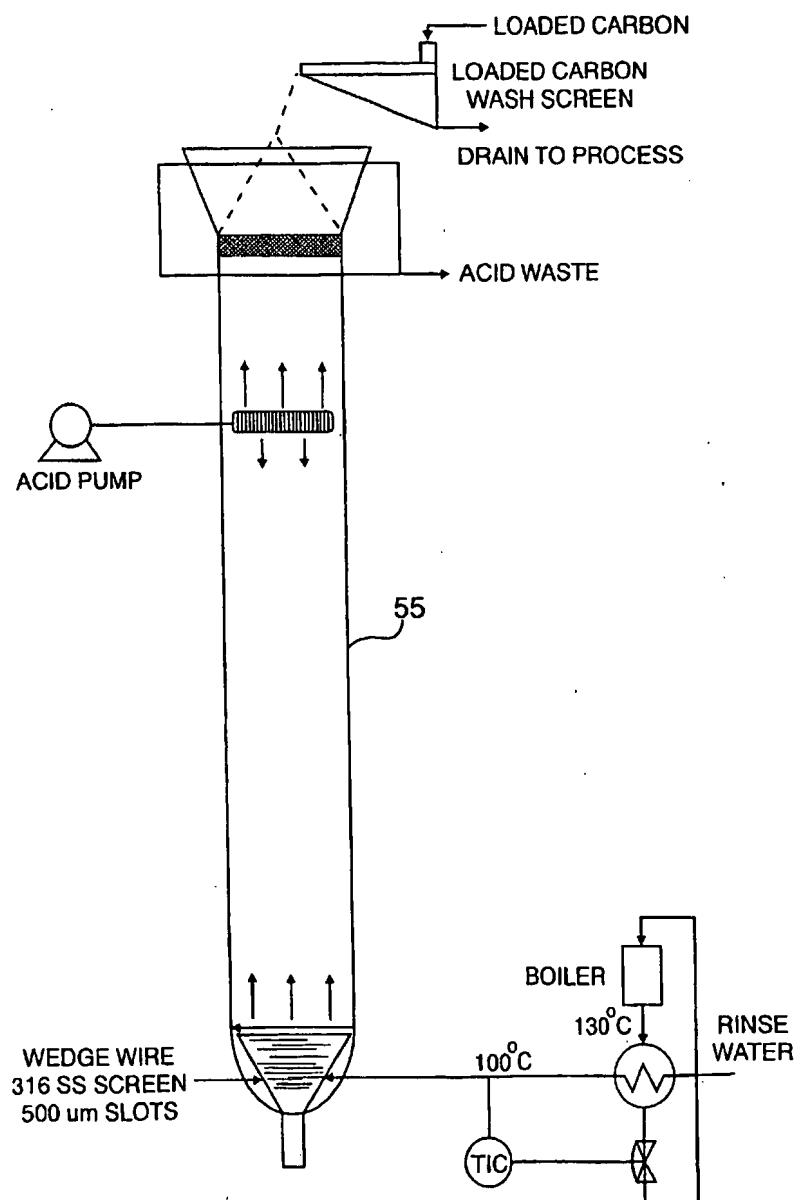


Fig. 5.

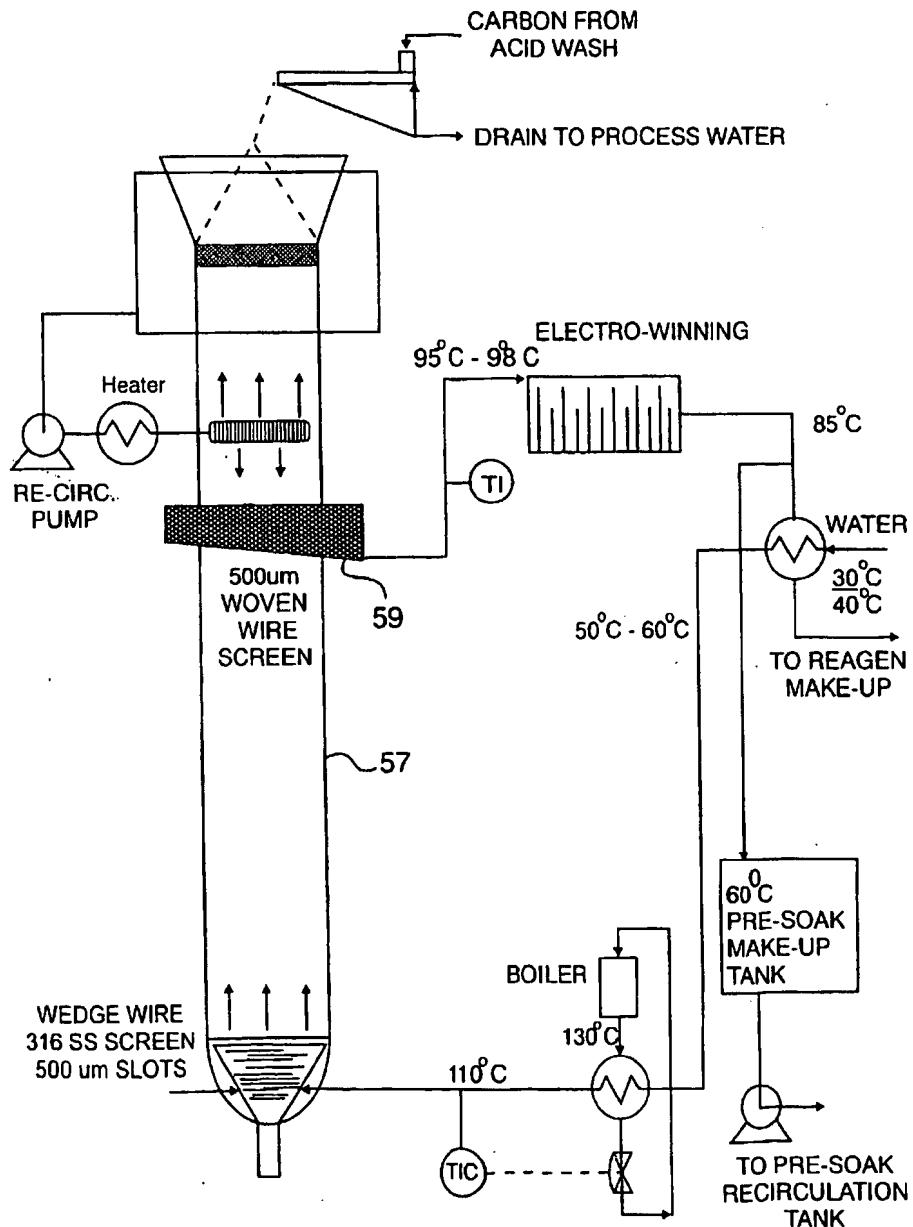


FIG. 6.

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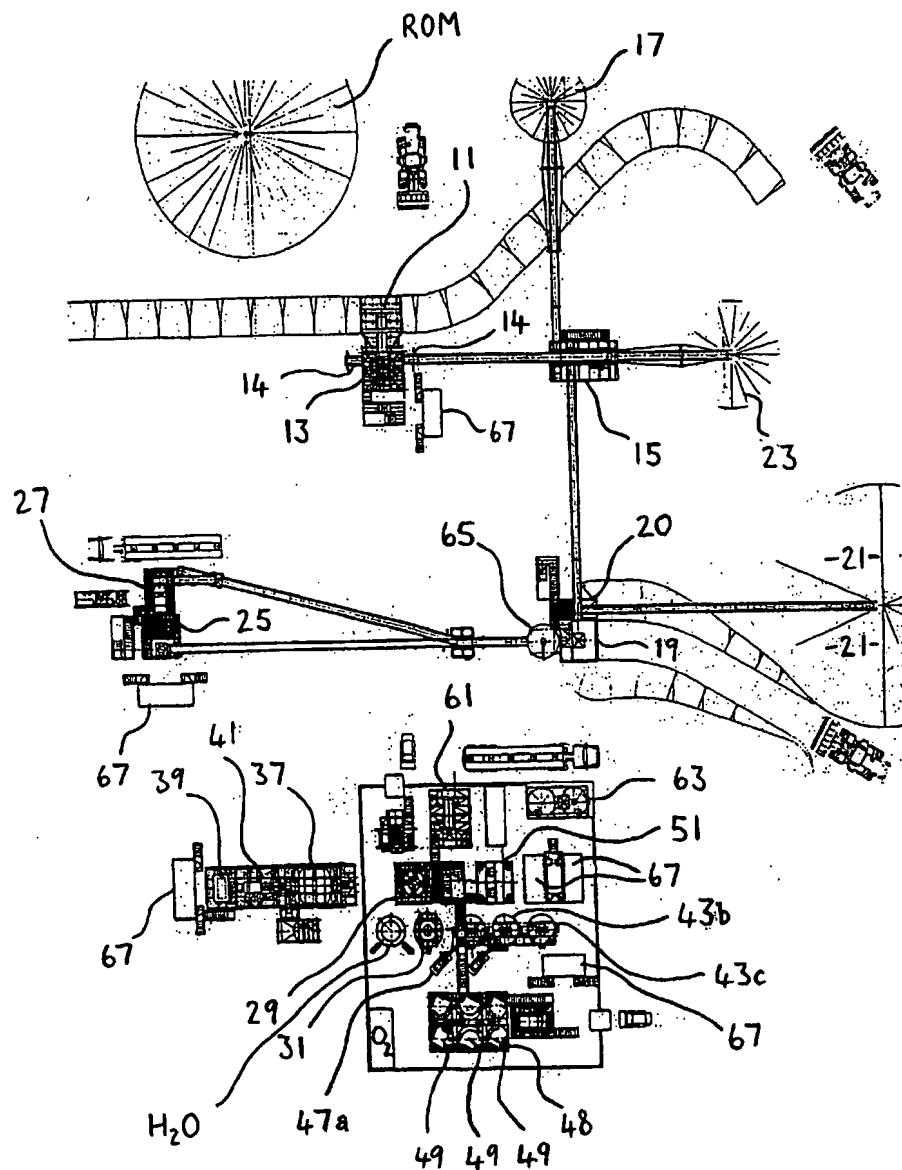


Fig. 7